WE CLAIM:

1. A giant magnetoresistive memory device comprising:

a magnetic storage layer;

a magnetic sense layer;

a non-magnetic spacer layer between the magnetic sense layer and the magnetic storage layer; and,

an antiferromagnetic layer formed in proximity to the magnetic storage layer whereby the antiferromagnetic layer couples magnetically in a controlled manner to the magnetic storage layer such that the magnetic storage layer has uniform and/or directional magnetization.

2. The giant magnetoresistive memory device of claim 1 wherein the magnetic storage layer comprises a ferromagnetic alloy.

3. The giant magnetoresistive memory device of claim 1 wherein the magnetic storage layer comprises ferromagnetic multilayers.

4. The giant magnetoresistive memory device of claim 1 wherein the storage layer is between the non-magnetic spacer layer and the antiferromagnetic layer, and wherein the non-magnetic spacer layer is between the storage layer and the sense layer.

5. The giant magnetoresistive memory device of claim 4 wherein the magnetic storage layer comprises a ferromagnetic alloy.

6. The giant magnetoresistive memory device of claim 4 wherein the magnetic storage layer comprises ferromagnetic multilayers.

7. The giant magnetoresistive memory device of claim 1 wherein the antiferromagnetic layer is between the non-magnetic spacer layer and the storage layer, and wherein the non-magnetic spacer layer is between the antiferromagnetic layer and the sense layer.

8. The giant magnetoresistive memory device of claim 7 wherein the magnetic storage layer comprises a ferromagnetic alloy.

9. The giant magnetoresistive memory device of claim 7 wherein the magnetic storage layer comprises ferromagnetic multilayers.

10. The giant magnetoresistive memory device of claim 1 wherein the antiferromagnetic layer comprises a first antiferromagnetic layer, wherein the giant magnetoresistive memory device comprises a second antiferromagnetic layer, wherein the storage layer is between the first and second antiferromagnetic layers, wherein the second antiferromagnetic layer is between the non-magnetic spacer layer and the storage layer, and wherein the non-magnetic spacer layer is between the second antiferromagnetic layer and the sense layer.

11. The giant magnetoresistive memory device of claim 10 wherein the magnetic storage layer comprises a ferromagnetic alloy.

12. The giant magnetoresistive memory device of claim 10 wherein the magnetic storage layer comprises ferromagnetic multilayers.

13. A giant magnetoresistive memory device comprising:

a magnetic storage layer;

a magnetic sense layer;

a non-magnetic spacer layer between the magnetic sense layer and the magnetic storage layer;

a first antiferromagnetic layer formed in proximity to the magnetic storage layer whereby the first antiferromagnetic layer couples magnetically in a controlled manner to the magnetic storage layer such that the magnetic storage layer has uniform and/or directional magnetization; and,

a second antiferromagnetic layer formed in proximity to the magnetic sense layer whereby the second antiferromagnetic layer couples magnetically in a controlled manner to the magnetic sense layer such that the magnetic sense layer has uniform and/or directional magnetization.

14. The giant magnetoresistive memory device of claim 13 wherein the magnetic storage layer comprises a ferromagnetic alloy.

15. The giant magnetoresistive memory device of claim 13 wherein the magnetic storage layer comprises ferromagnetic multilayers.

16. The giant magnetoresistive memory device of claim 13 wherein the magnetic sense layer comprises a ferromagnetic alloy.

17. The giant magnetoresistive memory device of claim 13 wherein the magnetic sense layer comprises ferromagnetic multilayers.

18. The giant magnetoresistive memory device of claim 13 wherein the magnetic sense layer comprises a first ferromagnetic alloy, and wherein the magnetic storage layer comprises a second ferromagnetic alloy.

19. The giant magnetoresistive memory device of claim 13 wherein the magnetic sense layer comprises first ferromagnetic multilayers, and wherein the magnetic storage layer comprises second ferromagnetic multilayers.

20. The giant magnetoresistive memory device of claim 13 wherein the storage layer is between the non-magnetic spacer layer and the first antiferromagnetic layer, and wherein the sense layer is between the non-magnetic spacer layer and the second antiferromagnetic layer.

21. The giant magnetoresistive memory device of claim 13 wherein the storage layer is between the non-magnetic spacer layer and the first antiferromagnetic layer, and wherein the second antiferromagnetic layer is between the sense layer and the non-magnetic spacer layer.

22. The giant magnetoresistive memory device of claim 13 wherein the first antiferromagnetic layer is between the storage layer and the non-magnetic spacer layer, and wherein the sense layer is between the second antiferromagnetic layer and the non-magnetic spacer layer.

23. The giant magnetoresistive memory device of claim 13 wherein the first antiferromagnetic layer is between the storage layer and the non-magnetic spacer layer, and wherein the second antiferromagnetic layer is between the sense layer and the non-magnetic spacer layer.

24. The giant magnetoresistive memory device of claim 13 wherein the first antiferromagnetic layer comprises first and second storage antiferromagnetic layers, wherein the second antiferromagnetic layer comprises first and second sense antiferromagnetic layers, wherein the storage layer is between the first and second storage antiferromagnetic layers, wherein the second storage antiferromagnetic layer is between the storage layer and the non-magnetic spacer layer, wherein the sense layer is between the first and second sense antiferromagnetic layers, and wherein the second sense antiferromagnetic layer is between the sense layer and the non-magnetic spacer layer.

25. The giant magnetoresistive memory device of claim 24 wherein the second storage antiferromagnetic layer is thinner that the first storage antiferromagnetic layer.

26. The giant magnetoresistive memory device of claim 24 wherein the second sense antiferromagnetic layer is thinner that the first sense antiferromagnetic layer.

27. The giant magnetoresistive memory device of claim 26 wherein the second storage antiferromagnetic layer is thinner that the first storage antiferromagnetic layer.

28. A method of fabricating a giant magnetoresistive memory device comprising:

forming a non-magnetic spacer layer between a magnetic sense layer and a magnetic storage layer; and,

forming an antiferromagnetic layer in proximity to one of the magnetic storage layer and the magnetic sense layer whereby the antiferromagnetic layer couples magnetically in a controlled manner to the one of the magnetic storage layer and the magnetic sense layer such

that the one of the magnetic storage layer and the magnetic sense layer has uniform and/or directional magnetization.

29. The method of claim 28 wherein the magnetic storage layer comprises a ferromagnetic alloy.

30. The method of claim 28 wherein the magnetic storage layer comprises ferromagnetic multilayers.

31. The method of claim 28 wherein the magnetic sense layer comprises a ferromagnetic alloy.

32. The method of claim 28 wherein the magnetic sense layer comprises ferromagnetic multilayers.

33. The method of claim 28 wherein the magnetic sense layer comprises a first ferromagnetic alloy, and wherein the magnetic storage layer comprises a second ferromagnetic alloy.

34. The method of claim 28 wherein the magnetic sense layer comprises first ferromagnetic multilayers, and wherein the magnetic storage layer comprises second ferromagnetic multilayers.

35. The method of claim 28 wherein the forming of a non-magnetic spacer layer between a magnetic sense layer and a magnetic storage layer comprises forming a non-magnetic spacer layer between a ferromagnetic storage layer and a ferromagnetic sense layer.

36. The method of claim 28 wherein the forming of an antiferromagnetic layer in proximity to one of the magnetic storage layer and the magnetic sense layer comprises forming the antiferromagnetic layer between the magnetic storage layer and the non-magnetic spacer layer.

37. The method of claim 28 wherein the forming of an antiferromagnetic layer in proximity to one of the magnetic storage layer and the magnetic sense layer comprises forming the antiferromagnetic layer so that the magnetic storage layer is between the antiferromagnetic layer and the non-magnetic spacer layer.

38. The method of claim 28 wherein the forming of an antiferromagnetic layer in proximity to one of the magnetic storage layer and the magnetic sense layer comprises:

forming a first antiferromagnetic layer in proximity to the magnetic storage layer; and,

forming a second antiferromagnetic layer in proximity to the magnetic sense layer.

39. The method of claim 38 wherein the forming of a non-magnetic spacer layer between a magnetic sense layer and a magnetic storage layer comprises forming a non-magnetic spacer layer between a ferromagnetic storage layer and a ferromagnetic sense layer.

40. The method of claim 38 wherein the forming of a first antiferromagnetic layer in proximity to the magnetic storage layer comprises forming the first antiferromagnetic layer so that the storage layer is between the non-magnetic spacer layer and the first antiferromagnetic layer, and wherein the forming of a second antiferromagnetic layer in proximity to the magnetic sense layer comprises forming the second antiferromagnetic layer so that the sense layer is

between the non-magnetic spacer layer and the second antiferromagnetic layer.

41. The method of claim 38 wherein the forming of a first antiferromagnetic layer in proximity to the magnetic storage layer comprises forming the first antiferromagnetic layer so that the storage layer is between the non-magnetic spacer layer and the first antiferromagnetic layer, and wherein the forming of a second antiferromagnetic layer in proximity to the magnetic sense layer comprises forming the second antiferromagnetic layer so that the second antiferromagnetic layer is between the sense layer and the non-magnetic spacer layer.

42. The method of claim 38 wherein the forming of a first antiferromagnetic layer in proximity to the magnetic storage layer comprises forming the first antiferromagnetic layer so that the first antiferromagnetic layer is between the storage layer and the non-magnetic spacer layer, and wherein the forming of a second antiferromagnetic layer in proximity to the magnetic sense layer comprises forming the second antiferromagnetic layer so that the sense layer is

between the second antiferromagnetic layer and the non-magnetic spacer layer.

43. The method of claim 38 wherein the forming of a first antiferromagnetic layer in proximity to the magnetic storage layer comprises forming the first antiferromagnetic layer so that the first antiferromagnetic layer is between the storage layer and the non-magnetic spacer layer, and wherein the forming of a second antiferromagnetic layer in proximity to the magnetic sense layer comprises forming the second antiferromagnetic layer so that the second antiferromagnetic layer is between the sense layer and the non-magnetic spacer layer.

44. The method of claim 38 wherein the forming of a first antiferromagnetic layer in proximity to the magnetic storage layer comprises forming first and second storage antiferromagnetic layers in proximity to the magnetic storage layer, wherein the forming of a second antiferromagnetic layer in proximity to the magnetic sense layer comprises forming first and second sense antiferromagnetic layers in proximity to the magnetic sense layer, wherein the storage layer is between the

first and second storage antiferromagnetic layers, wherein the second storage antiferromagnetic layer is between the storage layer and the non-magnetic spacer layer, wherein the sense layer is between the first and second sense antiferromagnetic layers, and wherein the second sense antiferromagnetic layer is between the sense layer and the non-magnetic spacer layer.

45. The method of claim 44 wherein the second storage antiferromagnetic layer is thinner that the first storage antiferromagnetic layer.

46. The method of claim 44 wherein the second sense antiferromagnetic layer is thinner that the first sense antiferromagnetic layer.

47. The method of claim 46 wherein the second storage antiferromagnetic layer is thinner that the first storage antiferromagnetic layer.